DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 09/04/2009 has been entered.

Claim Objections

2. Claim 9 is objected to because of the following informalities:

Claim 9 (last line): --"beaks"-- should be changed to -- "breaks"--

Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

> invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claims 1-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ellingsen (WO 00/47695; equivalent US Patent 6,660,158; hereafter, all the references will correspond to the US Patent) ("Ellingsen") in view of Roi (US Patent 2,454,466) ("Roi").

5. With respect to claim 1, Ellingsen discloses a cracking process wherein cracking is carried out in a cyclone reactor and in a riser with varying diameter [b] and with atomization nozzles (See figure 1; column 4, lines 41-44; column 6, lines 40-45) under the influence of a rotating and turbulent fluidized energy carrier in the form of fine grained minerals, the fluidized energy carrier in the form of fine grained minerals are put in motion [c] from a regenerator through two exit lines with outlet under the level of the fluidized bed and are transported to the riser by combustion gases in the fluidization reactor (See figure 1; column 5, lines 60-67; column 6, lines 13-61).

Ellingsen invention does not specifically disclose the regenerator temperature, however, the invention does disclose cracking temperature of 350 and 400^{o}C (See

column 7, lines 49-52; column 8, lines 1-3). Ellingsen also discloses that regenerated catalyst temperature above 900°C results in poor yields with high gas production due to local thermal cracking of the oil on contact (See column 4, lines 12-18). Ellingsen further discloses that the regeneration system may be designed in different manners. For example, it may consist of a fluidizer column whereby both the regenerated catalysts and the combustion air are brought back to the reactor (See column 7, lines 44-48).

Roi discloses a process of regenerating spent catalyst particles in hydrocarbon conversion process (See column 1, lines 1-5). Roi also discloses that the invention may be used where fouled catalyst or contact particles containing combustible deposits are regenerated by burning with air and it is necessary to limit the temperature during regeneration (See column 5, lines 48-52). Roi further discloses that the temperature in the regenerator is maintained between 1000-1150°F (538-621°C), preferably below 1075°F (579°C) (See column 5, lines 21-47; column 6, lines 22-27).

Thus, it would have been obvious to one skilled in the art at the time of invention to modify Ellingsen invention and use a regenerator as disclosed by Roi for a low temperature regenerated catalyst for improved yields.

6. With respect to claim 2, Ellingsen discloses that the energy carrier in the form of fine grained minerals is silica sand, alumina silicate or other fine-grained catalytic materials (See column 6, lines 49-51).

7. With respect to claim 3, Ellingsen discloses that the reactor cyclone [d] has an entrance which is diverting the flow of catalyst and gases whereby they will be subject to strong mechanical shear forces and where the catalyst may be evacuated from the reactor cyclone and be discharged to a regenerator [j] via a rotating valve system [l] (See figure 1; column 6, lines 13-61).

8. With respect to claims 4, 5 and 13, Ellingsen discloses that the deactivated energy carrier is regenerated in a fluidized regeneration chamber [j] receiving combustion gases or air and the energy carrier is regenerated by oxidizing accumulated coke (See figure 1; column 6, lines 49-67; column 7, line 1). Ellingsen also discloses that the regenerator comprises a heat exchanger [i] where the oil charge is preheated by the fluidizing effluents leaving the regenerator [j] (See figure 1 and column 6, lines 40-42). Ellingsen invention further discloses that the bottom of the regenerator has a fluidizer [m] (See figure 1), which is similar to the claimed fluidizing perforated plate above a plenum in the regenerator.

Ellingsen invention does not appear to specifically disclose steam generation in the heat exchanger, however, the invention does disclose preheating the feed by fluidizing effluents leaving the regenerator [j] (See figure 1; column 6, lines 40-42). It is to be noted that the stream from regenerator exiting the heat exchanger [i] is still at a temperature substantially higher than the ambient temperature. Thus, it would have been obvious to one skilled in the art at the time of invention to modify Ellingsen

invention and include a heat exchanger to utilize the hot effluents from the exchanger [i] and generate steam by passing cooling water. This will improve heat economy of the process and produce steam for downstream uses.

9. With respect to claims 6 and 14-20, Ellingsen discloses that the regenerated energy carrier is transported pneumatically by all or part of the stream of combustion gases (See column 4, lines 45-46; column 6, lines 57-61).

10. With respect to claim 7, Ellingsen discloses that the coke which is oxidized on the energy carrier substantially supplies the energy for the operation (See column 6, lines 37-39, 64-67; column 7, line 1; column 8, lines 32-36).

11. With respect to claim 8, Ellingsen discloses that the combustion gases are passed to a suitable condensing system consisting of a condenser [r] and [s] or a conventional distillation column (See figure 1 and column 7, lines 3-6).

12. With respect to claim 9, Ellingsen discloses that the feed oil is preheated by the heat of condensation of the gases and that the oil is atomized in a nozzle where it is mixed in atomized state with the gas stream delivered by [e] (See column 6, lines 40-45).

Although Ellingsen invention does not specifically disclose the details of working mechanism of a nozzle, however, it is well within the art to use steam to convert the oil stream into droplets in any standard nozzle design, including as claimed.

13. With respect to claim 10, Ellingsen discloses a cracking unit comprising a cyclone reactor and a riser of varying diameter [b] with atomization nozzles, an inlet of the cyclone reactor is provided in the lower part of the reactor, in order to bring the particulate energy carriers into an upward circulating movement with large shear and centrifugal forces, a perforated fluidizing plate situated approximately half a diameter from the bottom of the regenerator [j] over a plenum for the regeneration of the particulate energy carrier, as well as a heat exchanger [i], provided in the fluidized bed of the particles in the regenerator, in order to control the temperature (See figure 1; column 6, lines 1-61).

14. With respect to claims 11 and 12, Ellingsen invention discloses similar cracking unit as claimed by the Applicant, including varying diameter of the riser, and therefore, it is expected that the claimed acceleration and retardation of gas and particulate energy carriers and optimization of the collisions between the particles and the oil drops injected in the riser and thereby optimization of the energy transfer and mechanical collision forces between the particulate energy carriers and the oil droplets as claimed, should necessarily be achieved in Ellingsen's cracking unit also.

Similarly, because Ellingsen invention is using similar cracking unit, feedstock, and operating conditions as claimed by the Applicant, it is expected that the sonoluminiscense effect resulting in the hydrogenation of oil, as claimed by the Applicant, should necessarily be achieved by Ellingsen also.

Response to Arguments

15. Applicant's arguments filed 07/14/2009 have been fully considered but they are not persuasive.

16. In the arguments on page 9/11 (paragraph 3), the Applicant argues that one difference between Ellingsen and the presently claimed invention is that in the present invention the cracking takes place in the riser of varying cross section (FIG. 1, F) which is attached to a cyclone (FIG. 1, N). In Ellingsen the riser (FIG. 1, o) is simply used to pneumatically suck off the regenerated catalyst from the regenerator (column 6, 57 - 59 of Ellingsen). Velocities in the riser of the present invention are achieved through different diameters of the riser. Ellingsen does not teach or suggest a riser with varying cross section.

The Applicant's argument is not persuasive because Applicant's figure 1 and Ellingsen's figure 1, both have risers ([F] and [O], respectively) with uniform diameter. It is only the cyclone part of the reactor which has variable diameter in both cases. The

risers in both are attached with "reactor cyclones" ([N] and [a], respectively). Velocity in the riser of Ellingsen's is achieved by the same process as the Applicant's.

17. In the arguments on page 9/11 (last paragraph) and page10/11 (paragraph 1), the Applicant argues that the choice of the temperature range of 450-600^{o}C is not taught or suggested by Ellingsen.

The Applicant's argument is not persuasive because the new rejection (See Office action above under claim 1) uses Roi reference to show the regenerator temperature in a range of 1000-1150^{o}F (538-621^{o}C), preferably below 1075^{o}F (579^{o}C) (See column 5, lines 21-47; column 6, lines 22-27). It is to be noted that the range of regenerator temperature taught by the combined teachings of Ellingsen and Roi overlap the claimed temperature range. In the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a prima facie case of obviousness exists. *In re Wertheim, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); In re Woodruff, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990).*

18. In the arguments on page 10/11 (paragraph 2), the Applicant argues that Ellingsen does not teach or suggest atomization nozzles in the riser with varying diameter.

The Applicant's argument is not persuasive because as discussed earlier, Applicant's figure 1 and Ellingsen's figure 1, both have risers ([F] and [O], respectively) with uniform diameter. It is only the cyclone part of the reactor which has variable

diameter in both cases. Further, Ellingsen discloses atomization nozzles similar to the claimed invention (See figure 1; column 4, lines 41-48; column 6, lines 40-45).

19. In conclusion, the claimed invention is *prima facie* obvious over Ellingsen in view of Roi.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to PREM C. SINGH whose telephone number is (571)272-6381. The examiner can normally be reached on 7:00 AM to 3:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn Caldarola can be reached on 571-272-1444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/PREM C SINGH/
Examiner, Art Unit 1797